UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,313	11/18/2005	Michael J. Evans	M0025.0322/P322	9598

24998 7590 04/23/2007

DICKSTEIN SHAPIRO LLP
1825 EYE STREET NW
Washington, DC 20006-5403

EXAMINER	
COLEMAN, WILLIAM D	
ART UNIT	PAPER NUMBER
2823	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/527,313	EVANS ET AL.	
	Examiner	Art Unit	
	W. David Coleman	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-25* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/05*; 03-10-05
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

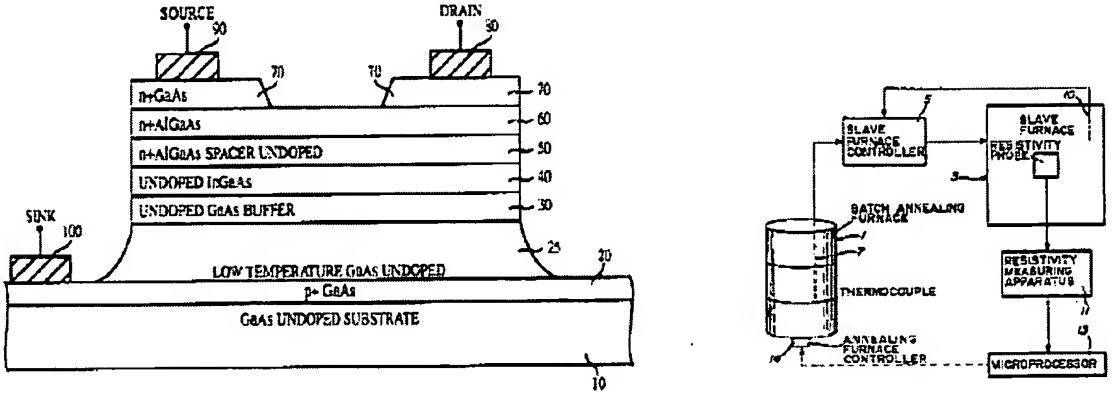
Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-7 and 10-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Folkes, U.S. Patent 6,541,803 B1 in view of Drew et al., U.S. Patent 4,595,427.

Folkes discloses a semiconductor process substantially as claimed. See **FIG. 1** wherein Folkes teaches the following limitations.



The image above on the left is attributed to Folkes and the image to the right is attributed to Drew.

Folks teaches a method for determining optimal annealing conditions for a semiconductor material (please see column 1, lines 40-49, where an anneal process is disclosed). However Folkes fails to teach obtaining a first set of values indicative of resistivity of the material for a plurality of annealing temperatures;

obtaining a second set of values indicative of carrier lifetime of the material for a plurality of annealing temperatures; and

comparing the first and second set of values to determine an annealing temperature or a range of annealing temperatures where the carrier lifetime and resistivity of the materials are optimized. Drew teaches a process of controlling the resistivity of a material during an anneal process. Please see the Abstract of Drew where a well known process called differential resistivity is used to control the progress of annealing. The Examiner takes the position that since both the material of Folkes having a carrier lifetime of less than 1 picosecond (i.e., 1 ps) and the annealing process of Drew to control the resistivity of a material during an anneal process, it would have been obvious to one of ordinary skill in the art to combined the prior art disclosures to teach Applicants invention.

Pertaining to claim 2, the combined teachings of Folkes in view of Drew teach the method of claim 1, further comprising: determining an optimum annealing duration for the material.

Pertaining to claim 3, the combined teachings of Folkes in view of Drew teach the method of claim 2, wherein the material contains As, and the optimum annealing duration is determined by obtaining a third set of values indicative of arsenic concentration of the material for a plurality of annealing durations and for at least one annealing temperature;

comparing the at least one third set of values with the first and second sets of values to determine an annealing duration and an annealing temperature which together optimize the carrier lifetime and the resistivity of the material (please note that the Examiner takes the

position that it is well known that intrinsic gallium arsenide is semi-insulating and having zero carrier-lifetime. To increase the carrier lifetime from zero a dopant is inherently required to change the resistivity of the gallium arsenide).

Pertaining to claim 4, the combined teachings of Folkes in view of Drew teach a method of enhancing characteristic properties of a semiconductor, the method comprising annealing a base material at a temperature of 475°C or less to form the semiconductor, the temperature being determined according to the method of claim 1 (see column 1, line 43 of Folkes and the anneal processing method of Drew).

Pertaining to claim 5, the combined teachings of Folkes in view of Drew teach the method of claim 4, wherein the characteristic properties enhanced includes carrier lifetime and resistivity (please note that carrier lifetime is inherently inversely proportional to resistivity in semiconductor materials).

Pertaining to claim 6, the combined teachings of Folkes in view of Drew teach producing a semiconductor material with photoconductive properties, the method comprising annealing the base material at a temperature of 475°C or less so as to enhance the carrier lifetime of the material and the resistivity of the material for use as a photoconductor, the temperature being determined according to the method of claim 1.

Pertaining to claim 7, the combined teachings of Folkes in view of Drew teach the method of claim 4, wherein the annealing occurs at a temperature in the range of 240°C and 450°C.

Pertaining to claim 10,the combined teachings of Folkes in view of Drew teach the method to claim 4, wherein the base material is formed in a growth chamber and annealing occurs outside the growth chamber.

Pertaining to claim 11, the combined teachings of Folkes in view of Drew teach the method according to claim 4 wherein the semiconductor is a Group III-V semiconductor with photoconductive properties.

Pertaining to claim 12, the combined teachings of Folkes in view of Drew teach the method according to claim 4, wherein the semiconductor comprises As.

Pertaining to claim 13, the combined teachings of Folkes in view of Drew teach the method according to claim 4, wherein the base material is GaAs.

Pertaining to claim 15, the combined teachings of Folkes in view of Drew teach the method according to claim 4, wherein the base material is InGaAs.

Pertaining to claim 16, the combined teachings of Folkes in view of Drew teach the method of claim 15, wherein the base material is annealed at a temperature in the range of 350°C to 450°C.

Pertaining to claim 17, the combined teachings of Folkes in view of Drew fail to teach the method according to claim 4, wherein the annealing is performed for fifteen minutes or less. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Pertaining to claim 18, the combined teachings of Folkes in view of Drew teach a semiconductor material formed using the method of claim 1.

Pertaining to claim 19, the combined teachings of Folkes in view of Drew teach a photoconductive element comprising InGaAs, said InGaAs having a carrier lifetime of at most 1ps.

Pertaining to claim 20, the combined teachings of Folkes in view of Drew teach a photoconductive emitter comprising the semiconductor material of claim 18 (please note that Folkes discloses that the device can be used for optical signal processors, distributed fiber optic network sensors and the like, see column 1, lines 50-59).

Pertaining to claim 21, the combined teachings of Folkes in view of Drew teach the emitter of claim 16, wherein the emitter is configured to emit terahertz radiation formed using a method according to claim 1.

Pertaining to claim 22, the combined teachings of Folkes in view of Drew teach a photoconductive receiver comprising the semiconductor material of claim 18.

Pertaining to claim 23, the combined teachings of Folkes in view of Drew teach the receiver of claim 22 wherein the receiver is configured to receive terahertz radiation.

Pertaining to claim 24, the combined teachings of Folkes in view of Drew teach a photoconductive antenna comprising a photoconductive substrate and two electrodes provided on the surface of said photoconducting substrate, said photoconducting substrate comprising InGaAs having a carrier lifetime of less than 1 ps.

3. Claims 8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Folkes U.S. Patent 6,541,903 B1 in view of Drew et al., U.S. Patent 4,595,427 as applied to claims 1-7, 10-13 and 15-24 above, and further in view of White et al., European Patent Application EP 0 606 776 A2.

The combined teachings of Folkes in view of Drew teaches a method according to claims 4 and 13 wherein the GaAs is grown in a molecular beam epitaxy reactor at a temperature in the range of approximately 200°C to 300°C. The combined teachings fail to teach a molecular beam epitaxy. However, molecular beam epitaxy is not new. White teaches a GaAs material fabricated by molecular beam epitaxy (column 4, line 41). In view of White it would have been obvious to one of ordinary skill in the art to incorporate molecular beam epitaxy in the combined teachings of Folkes in view of Drew because these requirements can be satisfied by using low temperature GaAs as the material for the dielectric layer (see column 4, lines 37-40).

Pertaining to claim 25, the combined teachings of Folkes in view of Drew and in further view of White, European Patent Application EP 0 606 776 A2 teach an investigative system comprising:

a laser configure to emit a pump beam having a wavelength in the range from 1.3 to 1.55 um,

an emitter configured to emit emitted radiation in response to irradiation by said pump beam; and

a detector for detecting said emitted radiation,

wherein either or both of the emitter or detector comprise InGaAs. White teaches the laser (see FIGS. 3-5 of White). In view of White it would have been obvious to one of ordinary skill in the art to incorporate molecular beam epitaxy in the combined teachings of Folkes in view of Drew because these requirements can be satisfied by using low temperature GaAs as the material for the dielectric layer (see column 4, lines 37-40) and the laser. Because Applicants have done nothing more than copied the combined prior art disclosures.

Objections

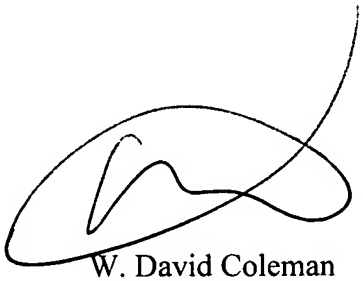
4. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 571-272-1856. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



W. David Coleman
Primary Examiner
Art Unit 2823

WDC